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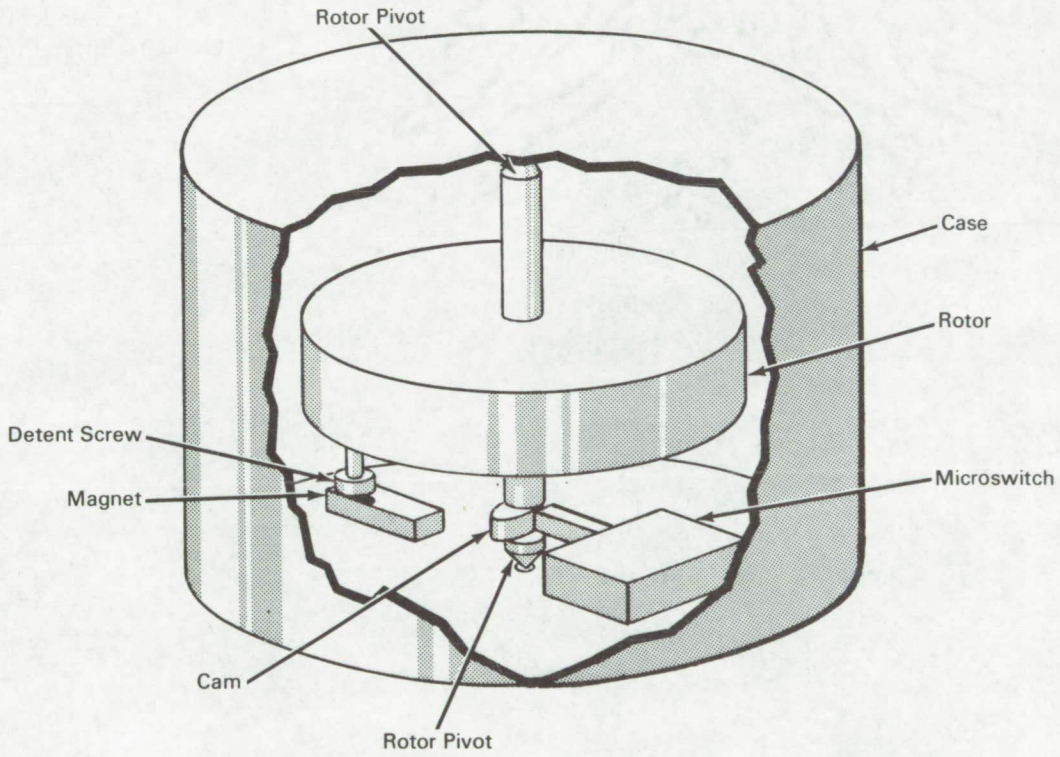
NASA TECH BRIEF

Switching Mechanism Senses Angular Acceleration



The problem:

To design a switching mechanism that will actuate an electrical circuit when a predetermined angular acceleration and displacement are reached.

The solution:

A switching mechanism incorporating a rotor that overcomes the restraint of a magnetic detent when the case in which the detent is mounted reaches the predetermined angular acceleration.

How it's done:

A balanced rotor with a high moment of inertia is mounted on pivots within the case. Rotary motion of the rotor is restrained by the action of the permanent magnet on the detent screw mounted on the rotor, and by the microswitch spring that exerts a centering force on the cam.

When the case of the switch undergoes angular acceleration, the torque acting to accelerate the rotor

(continued overleaf)

is transmitted through the magnetically coupled detent. When the angular acceleration of the case is greater than the angular acceleration produced by the torque acting on the rotor, the case will rotate relative to the rotor. As the relative rotation increases to approximately 6 degrees, the torque transmitted to the rotor decreases to a comparatively low value, because the rotor is no longer restrained by the detent. For the next 104 degrees of relative rotation, the rotor is restrained only by the small force of the microswitch spring. When the relative angular displacement between the rotor and the case reaches 110 degrees, the cam closes the microswitch. After closure, the microswitch will mechanically latch itself in the closed position. The switch can be reset manually by inserting a tool into a special hole in the case of the device.

Notes:

1. The angular acceleration switch is 3 inches in diameter and 7/8-inch high and weighs 0.5 pound.
2. The device will withstand axial sinusoidal vibrations of 25 g between 75 and 125 cps, and 15 g between 125 and 2000 cps.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B66-10158

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

Source: Ball Brothers Research Corporation
under contract to
Goddard Space Flight Center
(GSFC-462)